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NAVAL WAR COLLEGE  
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THE ENVIRONMENT AS AN OPERATIONAL CENTER OF GRAVITY

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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## CHAPTER I

### Introduction

The emphasis by the United States on ensuring protection of the environment can be viewed as a characteristic from which it derives its freedom of action. Joint doctrine defines a center of gravity as "that characteristic, capability, or locality from which a military force, nation or alliance derives its freedom of action, physical strength, or will to fight. It exists at the strategic, operational, and tactical levels of war."<sup>1</sup> Therefore an enemy may consider a U.S. center of gravity as protection of the environment and may try to exploit it.

Environmental issues have influenced warfare from the days of the Peloponnesian wars 2400 years ago to the current crisis in the Balkans. Some analysts consider environmental protection a national security issue.<sup>2</sup> The January 1993 National Security Strategy of the United States says, "Environmental degradation is one of the most pressing global problems."<sup>3</sup> The August 1991 National Security Strategy said, "environmental challenges [are] already contributing to political conflict."<sup>4</sup>

It is clear that protection of the environment can no longer be considered a back burner issue. Interest in environmental protection has increased exponentially over the last quarter century to the point where it is now considered an ideology that transcends socioeconomic classes and territorial boundaries.

The operational commander should be aware that protection of the environment during armed conflict and operations short of war has left the realm of the "nice to have" and entered the "must have" realm. At every level in the chain of command the operational commander will find strong support for the importance of considering environmental issues in planning and executing operations. In his first address to the Congress President Clinton spoke of the need for the United States to consider "challenges to the health of our global environment."<sup>5</sup>

## CHAPTER II

### DoD and the Environment in the 1990's

#### Environmental Mindset

Over the last quarter century environmentalism has influenced almost every facet of life in America. It has had a significant influence on industry, business, law, science, politics, education and our personal lives. Public opinion polls consistently demonstrate an increasing awareness, concern and support for environmental issues.<sup>6,7</sup>

Since the original earthday in 1970 events such as the Exxon Valdez oil spill in 1989 and Saddam Hussein's intentional oil fires and spills during Desert Storm in 1991 have strengthened the public's support for environmental protection.<sup>8</sup>

The public is aware that activities by industry or the military can significantly impact the earth's environment. Even children are introduced to the "evils" of a deteriorating environment every Saturday morning by "super heros" like Captain Planet. The Department of Defense recognizes the nation's commitment to a quality environment. Former Secretary of Defense Dick Cheney stated, "We must demonstrate commitment with accountability for responding to the Nation's Environmental agenda."<sup>9</sup> Increased public support for environmental protection is not limited to the United States. The Secretary for Defense of the Netherlands stated in 1991, "As a result of greater public awareness of environmental degradation, military forces will have to adapt to new rules...."<sup>10</sup>

The recognition that the public cares greatly about health, ecology and a clean environment was not lost on President Clinton who selected Al Gore as his running mate. Vice President Gore has gained a national and international reputation as an environmental advocate whose record was "second to none in the U.S. Senate."<sup>11</sup>

Being an environmentalist in the 1990's does not mean one is a radical but

rather an informed and responsible citizen. The Commandant of the Coast Guard, Admiral Vingo, appeared to appropriately represent the public's feelings when he said the "concern over pollution will not fade away."<sup>12</sup>

### The Law of Armed Conflict and the Environment

Though many environmentalists would like to restrict international law and the Law of Armed Conflict to the point where all warfare and, therefore, all damage to the planet is unlawful, most realize this is not realistic. The two main areas of focus for the environment within the Law of Armed Conflict are the impact of warfare on the environment and the use of the environment as a weapon.

The ecological damage during the Gulf War caused a renewed interest in the environment's connection and protection within the Law of Armed Conflict.<sup>13</sup> Colonel Terry in his now classic article on "The Environment and the Laws of War" discusses the history on the restriction of the environment. Examples of constraints placed on the use of environment include the Army's Lieber Code of 1863 that restricted the means and methods of warfare for Union forces in order to protect private property whose destruction was not necessary to the war effort.<sup>14</sup> Of particular significance was the Declaration of St. Petersburg of 1868 which proclaimed that the only legitimate objective of states during war is to weaken the military forces of the enemy.<sup>15</sup> The 1899 and 1907 Hague Conventions provided the foundation for one of the fundamental principles of the Law of War "The right of the principles to adopt means of injuring the enemy is not unlimited."<sup>16</sup> During the Nuremberg Trials following World War II the international tribunal found the regulations annexed to the Hague Convention IV of 1907 to be applicable whether the nations were parties to it or not.<sup>17</sup> Additionally, the Hague Convention Annex Article IV limited the rights of an occupying state with regard to the forests, public buildings, real property and agriculture works in the occupied country.<sup>18</sup> The Geneva Conventions of 1949 Article 50 of Geneva

Convention I provide that it shall be an extreme breach to commit extensive destruction and appropriation of property that is not justified by military necessity and is carried out unlawfully and wantonly.<sup>19</sup> Article 53 limits the destruction "of real or personal property" by an occupying power that is absolutely "necessary by military operations."<sup>20</sup> Once again affirming the fundamental principle that means of injuring the enemy are not unlimited.

During 1977 the environment was the focus of two treaties. The 1977 Convention on the Prohibition of Military or Any Other Hostile use of Environmental Modification Techniques (ENMOD Convention) limits the use of the environment as a weapon. The convention's formal understanding refers to modifications such as tsunamis, earthquakes and changes in climate patterns.<sup>21</sup> The convention prohibits the parties from engaging in military or any other hostile use of environmental modification techniques that cause widespread, long-lasting or severe destruction, damage or injury to any other state which is a party.<sup>22</sup> The United States is party to the treaty as is Kuwait. However it should be noted that Iraq is not party to the ENMOD convention.<sup>23</sup>

Also appearing in 1977 was the Protocol I addition to the 1949 Geneva Conventions. The Protocol I deals with the means and methods of warfare that "are intentional, or may be expected, to cause widespread, long-lasting and severe damage to the natural environment."<sup>24</sup> Of particular significance are the words "may be expected" as they could serve to bring into question many weapons or means which are otherwise within the Law of Armed Conflict. In furtherance of this point, Protocol I prohibits certain targets because regardless of their military value they "may be expected" to damage the natural environment. It also explicitly prohibits attacks against or the rendering useless of agricultural areas and drinking water installations for the specific purpose of denying sustenance to civilians.<sup>25</sup> The United States is not party to Protocol I. The United States made clear during treaty negotiations its understanding that nuclear



weapons were not included within the scope of Protocol I.<sup>26</sup> During ratification, many countries' interpretation took the view that nuclear weapons were included.<sup>27</sup> In the aftermath of the environmental damages of the Gulf War a "Fifth" Geneva Convention on the Protection of the Environment in Times of Armed Conflict was proposed in June 1991 by Greenpeace. After a number of meetings and symposiums, it was felt that international law as it currently stands provides adequate protection to the environment.<sup>28</sup>

Protection of the environment is a noble cause to which the United States and most developed nations are committed. But overly restrictive rules for protection of the environment might conflict with otherwise lawful military operations and could prevent an effective response to unwarranted and unlawful aggression.<sup>29</sup> Belligerents acting outside of one aspect of international law would be more likely to violate other aspects such as protection of the environment. In plain English it doesn't make sense to tie the hands of the good guys and let the bad guys do as they please.

#### Rules of Engagement

Rules of Engagement (ROE) are a tool the National Command Authority can use to control the escalation of a conflict or provide guidance for handling peacetime crisis.<sup>30</sup> The ROE are a subset of the Laws of Armed Conflict and have three specific purposes: political, legal and military.<sup>31</sup>

Though the precise effect of many industrial and military actions on the global environment is unknown, there is general agreement within the scientific community that mankind's actions are increasingly impacting the global environment. The ROE therefore provide an effective tool to communicate the nations environmental policy with regard to weapons employment (i.e., nuclear and chemical) and target selection. The support of the American public can be essential to an operation. As society becomes more ecologically conscious it will

become less tolerant of the indiscriminate use of today's modern and more deadly weapons.

Though the United States is not party to Geneva Protocol I of 1977 it may deem it prudent to protect specific installations such as dams and dikes or other installations containing dangerous forces. ROE could be used to protect these types of installations by limiting the level of authority to target.

Target selection could be conducted through a cost-benefit type analysis during peacetime to correlate the military benefit with the environmental cost. Major Jordan in his article on Petroleum Transit Systems proposes ROE with respect to disrupting an enemy's fuel supplies.<sup>32</sup> He recommends ROE that would permit the operational commander military flexibility but limit the collateral environmental damage by attacking the "environmentally less risky down stream stage of the [oil] industry". ROE could serve as the link between the changing threats to the physical environment and the nation's political goals on protection of the natural environment.

#### Environmental Terrorism

In recent decades, U.S. military forces have been called on to deter and counter international terrorism against American citizens and property abroad.<sup>33</sup> As an emerging facet of international terrorism, environmental terrorism vastly increases the number of potential targets. For example, in February 1991 six pipe bombs were discovered on chemical tanks only five miles from the U.S. Naval Base Norfolk. Fortunately, the timers on the bombs failed, the devices were removed without incident and substantial destruction was avoided.<sup>34</sup>

The open nature of society within the United States combined with Community Right-to-Know Laws has placed a plethora of information on the energy infrastructure and location, type and quantities of chemicals in the public domain. Current environmental statutes such as the 1986 Emergency Planning and

Community Right-to-Know Act (also known as SARA Title III) were passed by Congress to respond to the growing concern of toxic substances on humans and the environment. As an integral part of the community, the Navy's objective is to comply with the applicable substantive requirements of the law.

In late 1990 Captain K.M. Walker of the NYARNG (New York Army Reserve National Guard) conducted a survey to determine EPA data available on three military facilities in New York.<sup>35</sup> Through SARA Title III reporting he obtained information on the quantities of sulfur dioxide gas and liquid sulfuric acid stored at the Watervliet Arsenal.<sup>36</sup> The information obtained could have been used to disrupt the production at the nations only facility for mortar, cannon and gun barrels.

Our country remains highly dependent on the energy infrastructure for mobilization purposes. Yet the extensive U.S. energy infrastructure, oil, natural gas, and electrical systems are vulnerable to terrorist attack.<sup>37</sup> An attack on a nuclear power plant, hydroelectric dam or petroleum storage facility could unleash tremendous forces against the environment. The FBI views radical environmentalists as one of the most troublesome domestic terrorist organization for the energy sector.<sup>38</sup> In May 1989 the FBI arrested members of the Evan Mecham ECO-Terrorist International Conspiracy who were planning an attack on a Department of Energy nuclear facility.

Operational commanders should be aware that extensive information is available in the public sector on Defense Department chemical locations and quantities and that our domestic energy infrastructure is considered vulnerable. The targeting of the environment by terrorists greatly increases the number of potential targets. Experts predict the future will bring more acts of environmental terrorism.<sup>39</sup> The same values we cherish as a nation, such as protecting the environment, become targets for a terrorist to further their misguided beliefs.

Operational commanders may see the day when they must devote substantial assets to protect environmental targets, such as hydroelectric dams, chemical plants, or oil tankers.

### National Security

An emerging area of study is the environment as a national security matter.<sup>40</sup> The National Security Strategy of the United States addresses the concern of global environmental degradation.<sup>41</sup> Issues such as air pollution, water pollution, deforestation, threats to biodiversity and climate change are connected to the sovereign responsibility of a nation to protect its people. Many environmental and natural resource problems transcend political or territorial boundaries. The threat, or perception, of one nation's pollution infringing on the quality of another's air or water might be viewed as a security issue. Global environmental issues, including acid rain, global warming and destruction of the ozone layer, are gaining acceptance within the international community.

Some analysts have linked ecological degradation and national security because they believe the degradation may cause or exacerbate war.<sup>42</sup> With a growing world population competing for earth's limited resources impact by one nation's pollution on another nation's resources might be considered an act of aggression.

The following resource and environmental threats may cause or exacerbate war:<sup>43</sup>

- Resource maldistribution: access to non-renewable energy and mineral sources
- Attacks on resources: attacks on strategic resources and energy infrastructure (e.g., nuclear power plants) and the resultant collateral damage
- Collateral environmental contamination: intentional and direct manipulation of the environment
- Water wars: disputes over fresh water supplies
- Poverty wars: declining living standards leading to internal then external turmoil
- Pollution wars: intentional crossborder pollution

Al Gore called for a "Global Marshall Plan" and a technology focused "Strategic Environmental Initiative" for confronting the root causes of global ecological degradation.<sup>44</sup> The good news is that the concern over threats to the global environment have brought many nations together in cooperative agreements, summits and technology transfers. Most environmental problems are local but some threaten the global ecological system and a nation's survival.<sup>45</sup> These external threats require a broadening of the definition of national security.<sup>46</sup>

### CHAPTER III

#### Ecological Warfare

##### Historical Perspective

The Laws of War distinguish between combatants and non-combatants. However, with the arguable exception of wars for resources, when the environment suffers in warfare that distinction can no longer be made as the effect is not usually contained to the time or place of attack. Many of the means and methods of warfare described in this section were considered lawful when employed and some are still lawful today. Some were in response to acts of aggression. Indeed, in some of the instances it can be argued that the means chosen resulted in less death or destruction than other means available.

Unfortunately, Iraq was undeterred by President Bush's January 5, 1991 warning to Saddam Hussein to not cause the "destruction of Kuwait's oil fields."<sup>47</sup> One of the most blatant abuses of the environment during war was Iraq's dumping of crude oil into the gulf and setting fire to a number of oil wells and storage tanks. Estimates are that it may take decades for damaged portions of the Gulf's ecosystem to fully recover from this devastation.<sup>48,49</sup>

Despite the world attention that focused on Iraq's intentional damage to the Gulf's ecology during the Gulf War the environment is being used as a weapon in 1993. The Serb nationalist forces sabotaged the Peruca Hydroelectric Dam in

southern Croatia.<sup>50</sup> Twenty thousand people are estimated to live in the path of the torrent of water that could be unleashed. The potential damage to agricultural fields could take years to recover.<sup>51</sup>

History is replete with many examples of environmental warfare. Most lists would include many of the following examples. Nations have used and threatened to use the earth's natural resources and environment as weapons, victims and objects of war for thousands of years. Over 2400 years ago the Athenians fought a naval battle at Thasos over resources controlled by the Thasians.<sup>52</sup>

During the first century BC in what is now Italy, Lucretius described a huge fire "to scare enemies in some woodland war."<sup>53</sup> In the Franco-Dutch War of 1672-78 the Dutch were partially successful in stopping the advancing French forces by cutting dikes to create the so called Holland-Waterline.<sup>54</sup>

During the second Anglo-Boer war of 1899-1902 the Boers set fire to large areas of Veldt to deny forage to the advancing British forces.<sup>55</sup> World War I saw the wide scale use of chemical agents which resulted in thousands of fatalities.<sup>56</sup>

Possibly the most devastating act of environmental warfare occurred in 1938 during the second sino-Japanese War of 1937-1945. To stop the advancing Japanese the Chinese dynamited the Huayankow dike of the Yellow River. This intentional flooding for military purposes resulted in millions of acres of farmland being inundated and topsoil destroyed. Several thousand Japanese drowned, several hundred thousand Chinese drowned and millions were left homeless.<sup>57</sup> World War II and the Korean War saw numerous attack on large dams. Many of which were considered very successful.

In 1944 the Germans intentionally flooded 200,000 hectares of farmland in the Netherlands with saltwater. This destroyed about 17% of Netherland agricultural land and required a huge rehabilitation program.<sup>58</sup> The Nazi's systematic pillaging and ruthless exploitation of Polish forests during WWII was the basis for charges of war crimes.<sup>59</sup> The second world war also saw extensive

fire damage by the U.S. and allies against German and Japanese cities. Incendiary attacks were launched against Hamburg (August 1943), Dresden (February 1945) and Tokyo (March 1945). Some estimate that the incendiary attack against Tokyo was the most destructive ariel attack of WWII.<sup>60</sup> Some attempts at incendiary attack during WWII were less successful such as Japan's attempts at starting forest fires in the western U.S. by delivering incendiary weapons in balloons.

In 1945 the world saw the first use of atomic weapons and their tremendous potential ecological effect.<sup>61</sup> During the Vietnam war clouds were seeded with silver iodide to produce rainfall on the enemies lines of communication. The Vietnam war also saw extensive uses of chemical defoliants.

In recent decades, attacks have been timed for execution to minimize potential environmental damage from targets or weapons. Examples include the Israeli attack in June 1981 that destroyed the Iraqi Osirak nuclear plant before its fuel was loaded.<sup>62</sup> Other examples are the targeting of chemical production facilities during Desert Storm 1991 and the January 1993 cruise missile attack on the Baghdad nuclear production facility.<sup>63</sup>

#### Ecological Effects of War

"The control of nature is a phrase conceived in arrogance, born of the Neanderthal age of biology and philosophy, when it was supposed that nature exists for the convenience of man."

Rachel Carson (p.297 Silent Spring, 1962)

Rachel Carson's Silent Spring enlightened many on the interrelations and interactions between living things within an ecosystem. All means and methods of warfare can effect ecosystems. Many of the longterm effects remain unknown. The U.N. Environmental Program (UNEP) team in the Gulf found 'extensive damage' but also noted that environmental information related to the Gulf War was often controversial and contradictory.<sup>64</sup>

During this century mankind's ability to alter his environmental

surroundings has increased more than during all previous history combined. Today's precision guided munitions were not foreseen a few decades ago. Similarly we do not know exactly what capabilities tomorrow's technology will bring. For example man may develop the ability to open temporary windows in the ozone layer, divert celestial bodies or develop biological weapons that effect only certain ethic groups.

Military operations can damage all domains of the environment and damage to one domain usually interrelates with one or more of the others. For example the effects of water pollution can be found in the air, soil, and living organisms. In this section I will look at the possible impacts of military operations on the environment. I will approach the impact from four domains: the atmosphere, lithosphere, hydrosphere and biosphere.

### Atmosphere

The atmosphere has always been impacted by natural forces such as, volcanic eruptions, but human action in the industrial society has had an increasing ability to alter the atmosphere. Excessive emissions of pollutants such as, sulfur dioxides, nitrous oxides and particulates directly affect the health of animals and plants. Emissions of carbon dioxide and chloroflourocarbons are believed to contribute to global climate change and ozone layer depletion respectively.

The indirect effect of employment of nuclear weapons is extimated to be 1000-10,000 tons of dust (particulates) and 10,000 tons of nitrogen oxides in the atmosphere per megaton of TNT equivalent. The dust cloud from a nuclear weapons explosion could also reduce surface temperatures, the so called Nuclear Winter.<sup>65</sup>

In January 1991, during the Gulf War, Iraq intentionally set fire to over 600 oil wells.<sup>66</sup> It was not until November 6, 1991 that the last well was capped. The blazes reached 200 feet in the air and caused oil laden clouds as high as



20,000 feet. Particulate counts at several thousand feet in the air were measured to be significantly higher than U.S. air quality standards.<sup>67</sup> The fires also caused severe local pollution and choking fog at ground level. They are estimated to have caused daytime temperatures to fall as much as 15 degrees centigrade below normal.<sup>68</sup> Experts predict severe smoke-related health problems for the Kuwaitis, especially among the elderly, sick and the very young.<sup>69</sup> Additionally military personnel operating within the smoke plume area may experience possible longterm health effects.<sup>70</sup> The global carbon emissions from the oil well fires are estimated to have nullified international efforts to reduce carbon related contributions to global climate change.<sup>71</sup>

Numerous large industrial chemical facilities exist throughout the world. Since many of the chemical plants are located in major river valleys and near energy facilities there is a high probability these plants could be attacked or damaged during war.<sup>72</sup> Atmospheric damage would depend on the type of chemical facility, type and quantity of chemicals stocked, ability to control damage, and the weather conditions at the time of attack.<sup>73</sup> Peacetime accidents at chemical facilities provide insight into possible ecological effects. The rupture of a phosgene tank at the Muggenburg Chemical Plant in Hamburg on 20 May 1928 resulted in a toxic plume of phosgene gas that killed eleven people at distances up to 2000 metres and wounded 150 people at distances up to 7000 metres from the plant.<sup>74</sup> In July 1976 an accidental explosion at a trichlorophenol chemical factory in Seveso, Italy contaminated 300 hectares with dioxin and required longterm evacuation of hundreds of local inhabitants and destroyed large quantities of produce and crops. It required several years to restore and decontaminate.<sup>75</sup> In December 1984, the worst industrial disaster in history occurred at the Bhopal, India Union Carbide Plant when nearly 40,000 tons of highly toxic methylisocyanate was accidentally discharged into the atmosphere. About 2500 residents were killed and about 100,000 were adversely affected. The toxic discharge also killed more than 2000

animals.<sup>76</sup>

Though accidents involving chemical facilities can release chemicals into the hydrosphere, usually the potential for human suffering is greater from atmospheric releases.<sup>77</sup>

### Lithosphere

The lithosphere, or land, is the solid and rocky part of the earth's crust. Damage to the lithosphere can result from manipulation of the land for hostile purposes, soil contamination or soil displacement.

A potentially devastating manipulation of the land would be the release of contained waters by the destruction of dams, dikes and levees. The resultant destructive floods could destroy extensive agriculture areas.<sup>78</sup> Release of salt water into agricultural areas would take even longer to restore. There are 72 major dams in 21 countries that hold more than 1000 million cubic metres of water. More than half of these are in the United States and the former Soviet Union. These 72 major dams and the numerous lesser dams, dikes and levees are potential targets because of the tremendous potential forces they harness and their importance to societies (e.g., hydroelectric dams).<sup>79</sup> Other possible manipulations of the lithosphere could involve initiating soil, rock or snow avalanches in avalanche prone mountains.

There are some 300 nuclear power plants located in 25 different countries.<sup>80</sup> Additionally, there are nuclear weapons factories, nuclear waste storage, repositories and other facilities that contain large quantities of radioactive materials. If a nuclear facility was damaged, directly or indirectly, the result would be considerable damage to the surrounding area. The contamination to the surrounding area from radioactive elements could render an area uninhabitable for decades.<sup>81</sup>

Terrestrial destruction - damage to soil, food, and agriculture - was one of

three focus areas for the United Nations Environment Programme (UNEP) task force on regional environmental damage from the Gulf War.<sup>82</sup> Lithospheric damage during the Gulf War may have included soil structure alterations caused by the thousands of military vehicles that operated in the deserts of Saudia Arabia, Kuwait and Iraq. This could cause worsening of sandstorms.<sup>83</sup> The deserts of Libya are said to be still scarred from World War II operations conducted by the mechanized divisions of Rommel and Montgomery<sup>84</sup>. In sections of the Mojave Desert that were used by Patton for training during World War II vegetation has not recovered.<sup>85</sup>

Soil displacement can be caused by conventional, as well as nuclear weapons. Deep cratering can disturb water tables and local drainage for years.<sup>86</sup> The thermal stress on the soil may be of sufficient magnitude to cause collapse of the pore structure.<sup>87</sup> Destroyed soil structure, altered drainage or top soil erosion can lead to desertification.<sup>88</sup> As the vital link between living organisms (biotic) and nonliving structures (abiotic) the effects of severe soil damage can be felt throughout an ecosystem.<sup>89</sup>

#### Hydrosphere

Population growth coupled with the needs of modern society will continue to increase the demand on water supplies. ENMOD convention, Article II states, "the term 'environmental modification techniques' refers...to deliberate manipulation of...the earth...including its hydrosphere."<sup>90</sup> The "understanding" for the ENMOD convention provides a nonexhaustive listing of illustrative examples of Environmental Modification. Included are changes in ocean currents, tsunamis and an upset in the ecological balance of a region.

It is projected that a nuclear weapon detonated underwater could generate a seismic sea wave - tsunami - that would destroy coastal cities and developments. Operations lower on the continuum might see manipulation of rivers or other sources of fresh water. Egypt's dependence on the Nile river gives it cause for

concern that an upriver nation might restrict or change the river's flow. In 1985, Egypt's minister of foreign affairs was quoted as saying, "The next war in our region will be over the waters of the Nile, not politics."<sup>91</sup> Damage to the hydrosphere which impacts water quality could have ramifications throughout an ecosystem. Fresh water issues have become acute in many areas to include the Middle East, Europe (lower Rhine) and sub-Saharan Africa.<sup>92</sup> Water supply problems in one region can indirectly impact other regions by increasing agricultural import demands.<sup>93</sup>

### Biosphere

This section examines the potential for armed conflicts to impact the living component of the environment - the biosphere. Warfare can impact the biosphere in many ways including (a) chemical contamination, (b) biological means, (c) incendiary means and (d) mechanical purposes.

The forests of the earth can be devastated by defoliants (herbicides) or incendiary means. This could cause extensive damage to an area's wildlife and its nutrient budget.<sup>94</sup> The latter through nutrient dumping (loss of nutrients in soil) and soil erosion. Destruction of the vegetation in a tundra ecosystem could result in thawing and severe soil erosion. The results could be a regional ecosystem unbalanced for decades.<sup>95</sup>

Most chemical and biological warfare agents dissipate or die in open air in hours. Those that penetrate the soil usually disappear within a few weeks at most.<sup>96</sup> However, anthrax, an infectious spore forming bacterium, could linger dormant in the soil for decades.<sup>97</sup> The Scottish island of Gruinard was used for military applicaiton testing of anthrax during 1941-2 and is still dangerously contaminated.<sup>98</sup>

The marine pollution caused by oil spills can cause extensive damage to coastal ecosystems, fisheries and habitats of endangered species. Iraq's

intentional flooding of oil into the Gulf was probably the largest oil spill ever. It covered 600 square miles of sea surface and 300 miles of coastline and was estimated to be as much as six million barrels.<sup>99,100</sup> Some of the fish and shrimp habitats, such as the sea grasses and mangroves, may take years to recover.<sup>101</sup> Another potential concern from oil spills on land or water is ground water contamination.

The Persian Gulf was already badly contaminated from oil spills and only time will tell if Iraq's intentional release will be the "final straw"<sup>102</sup> or if the Gulf's history of adaptation to oil spills will result in less damage than initially expected.<sup>103</sup>

Warfare's ability to cause biospheric degradation may be as pervasive as widespread radioactive contamination of plants or as subtle as the fragments from a high explosive weapons blast opening a way for trees to be invaded by micro-organisms.<sup>104</sup>

## CHAPTER IV

### Limitations on the Operational Commander

#### Media

The protection of the environment continues to be covered prevelantly by the press. Many periodicals devote sections to nature, ecology and environmental protection. The number of publications devoted exclusively to the environment appears to increase every year. Television programs, to include children's shows, cover the merits of recycling and saving the rain forests. In 1989 Time magazine selected the endangered earth as 'Planet of the Year.'

During the Gulf War the media had the technology to transmit military operations live. Coverage of Desert Shield and Desert Storm dominated the news. Indeed, the media coverage became part of the news and it was not uncommon to hear high level DoD officials mention that they received their information from "CNN."

The operational commander can gain substantial information on the enemy, or a closed society, through the press. Television has become a global institution that can cross political boundaries. The TV journalists had much greater access to Iraq than they had to North Vietnam.<sup>105</sup> Although journalists do not make policy or plan operations, they have the ability to "frame" issues.<sup>106</sup> The public's knowledge of an enemy's actions and its own nation's comes almost exclusively from the press.

The public's support for an operation can be directly related to its portrayal by the press. Public opinions influence will grow as the focus shifts from global to regional conflicts that do not necessarily threaten the survival of the United States. The military's ability to convey Iraq's crimes against nature through the media helped garner support for coalition actions. Iraq's actions which riveted the world's attention were labeled as "environmental terrorism." The media which had been vital in increasing public awareness of environmental issues focused its attention on the massive coalition response to the spills. The focus on Hussein's callous ecological devastation helped galvanize public resolve.

Operational commanders should be aware that environmental issues will probably continue to be a media focus in future conflicts. The press will probably be very unforgiving of a commander who through intent or ignorance and without military necessity severely damages the environment.

### Political

Whereas most Americans probably do not remember the particulars of President Bush's environmental agenda they do remember his determination during the 1988 campaign to be the "Environmental President." President Clinton boosted his environmental standing by selecting Al Gore, a politician with a strong pro-environment reputation, as his running mate. Speaking out against protecting the environment has become rare, if not suicidal, in today's political climate.

Environmental ramifications are being factored into an increasing array of political decisions. The former Administer of the Environmental Protection Agency, William Reilly, stated in his last official press conference that EPA was consulted in the North American Free Trade Agreement and that he expects the EPA participation in future non-traditional environmental issues. The American committment to a clean environment is not just rhetoric. Costs for pollution control efforts are expected to be 2.49% of the GNP for 1993 and are projected to increase to 2.83% by 2000.<sup>107</sup> The new administration called for the United States to "provide real international leadership to protect the world's delicate environmental balance."<sup>108</sup>

The environmental-political climate could directly effect operations through more restrictive Rules of Engagement. Commanders need to consider the collateral environmetal damage associated with target and weapons selection. Former Assistant of the Navy for Installations and Environment, Jacqueline E. Schafer said, "Leadership in environmental compliance and natural resources conservation is an absolute must for every command..."<sup>109</sup> The political climate has effectively removed the "military necessity" shield from an operational commander's responsibilities to protect the environment.<sup>110</sup>

If it's not already asked, I'm sure in the future national policy makers will ask, "How will the operation impact the environment?"

### Training

The first strategic principle in the National Military Strategy of the United States is "readiness." As a hands-on profession the military requires demanding and realistic training and exercises to maintain its readiness and proficiency.<sup>111</sup>

Training conducted within the United States is subject to a myriad of domestic environmental regulations. Environmental compliance can present a great

challenge to operational commanders as they develop realistic training scenarios. Former Secretary Cheney stated failure to comply can result in loss of "access to the air, land and water we need to maintain and improve our mission capability."<sup>112</sup>

Because many military installations are on predominately coastal lands, DoD has responsibility for some very sensitive ecosystems. Some bases are ecological islands in a sea of development. At Camp Pendleton, in Southern California, amphibious training exercises must be scheduled around the nesting season of the least tern. The least tern is a species of bird listed as an endangered species and as such is protected by the Endangered Species Act of 1973. On the East coast at Camp Lejuene, Fort Benning and Fort Bragg training is greatly restricted to protect the red cockaded woodpecker, an endangered species.

Major training exercises may require documentation under the National Environmental Policy Act (NEPA).<sup>113</sup> The NEPA process requires the commander to assess and consider the environmental impacts of the proposed actions. Restrictions or mitigation actions may be required in order to conduct the training.<sup>114</sup>

The Department of Defense is subject to a regulatory process that was described by the Deputy Assistant Secretary of Defense for Environment, Thomas E. Baca, as often leading to "a gridlock of regulatory overlap and conflict."<sup>115</sup> DoD commands interface with regulators from the EPA, ten regional EPA offices, 50 state environmental departments and county and local air and water boards. Many of these regulators have begun to focus on military training.<sup>116</sup> An example is one state's attempt to regulate the burning of excess artillery propellant bags during fire exercises. Some activities conducted during field training exercises may require air emission permits. Flight operations can be restricted by concerns over aircraft noise or impacts on wildlife. A coalition of environmental organizations has recently gone to court to stop the U.S. Navy's use of Sea Lion



Rock for bombing target practice.<sup>117</sup>

Environmental requirements are extended to U.S. commanders overseas through Executive Order 12114 "Environmental Effects Abroad of Major Federal Actions" and Status of Forces Agreements. As previously stated environmentalism transcends political boundaries. For example, the Netherlands established an environmental management plan for defense in 1989 that includes conditions on the use of military terrain for training.<sup>118</sup> Growing environmental restrictions in Germany are making training and stationing of foreign forces in that country less attractive.<sup>119</sup>

Commanders must be aware that vital military training can be affected by the growing environmental regulations and the greater value that people attach to nature and the environment. A failure to comply can result in critical training suffering or even being cancelled.

#### Unit and Weapons Employment

In an increasingly complex world operational commanders need the greatest flexibility possible in responding to crisis and conflict situations. Yet this complexity is coupled with an ever increasing understanding of the interaction of processes within nature.

Commanders will be required to determine how they can obtain their objectives at the minimum cost to the environment. Commanders may find attacks to disrupt enemy fuel supplies will need to focus on the environmentally less risky downstream stage of the petroleum industry.<sup>120</sup> The downstream stage, or final processing stage, includes the refineries and small-volume carriers as opposed to the tankers, drilling platforms, pipelines and other production elements of the upstream stage. During the Gulf War the coalition targeted the oil refining and distribution facilities.<sup>121</sup>

Destroying an enemy's ability to provide electric power may be any integral

part of isolating and incapacitating its command control and communication. Destructive attacks on nuclear power plants or hydroelectric power plants could cause tremendous widespread ecological damage. The 1986 Chernobyl accident showed that reactors can suffer extreme failure when damaged and cause death and economic hardships at great distances.<sup>122</sup> Commanders may be required to target the electric power transmission facilities vice the power generation facilities.

Environmental constraints on targeting could compete for the limited and costly precision-guided munitions. Special operations forces provide the operational commander with an additional capability for surgical strikes against the environmentally less risky node of a key enemy capability. Special Operation Forces such as the Navy SEALs, may find an expanding role in stopping or minimizing damage from acts such as Saddam Hussein's intentional oil release.<sup>123</sup>

Operational commanders will also need to view their own rear area operations to ensure adequate security is provided to organic equipment and facilities that could potentially cause severe ecological damage. Operations will be severely hampered by extreme pollution or contamination. Pollution can impact operations across the spectrum of conflict.

Counter-environmental damage operations may be assigned high priorities by commanders in future operations. Operational commanders will probably find that the pressures of fighting an environmentally clean war in the future will present even more challenges for their scarce resources.

## CHAPTER V

### Conclusion

Clausewitz defined war as "an act of force to compel our enemy to do our will."<sup>124</sup> As such, it can cause tremendous degradation to the natural environment. When the environment falls victim the costs can far exceed the intentional physical force and destruction necessary to compel an enemy to do your

will. Modern technology brings destructive capabilities to the battlefield that were beyond comprehension during Clausewitz's lifetime.

The end of the cold war has brought a significant shift in focus for the military. Emphasis has switched from the Soviet threat to regional threats. But while the global military threat is declining, global environmental threats appear to be increasing.

The ever increasing value placed on the environment will influence decision making by operational commanders. Considerations for the commander include:

- understanding the connections between nature and mankind.
- being aware of the relationship between the environment and the law of war.
- determining possible environmental damage from target selection and weapons selection.
- balancing military necessity and environmental protection.
- staying abreast of the connection between public support and protecting the environment.
- knowing own forces vulnerabilities to ecological contamination.
- understanding how an enemy could exploit the environment.

With apologies to Clausewitz let me offer the following definition for environmental protection: Environmental protection is the center of gravity for earth, the hub of all life, on which everything depends.<sup>125</sup>

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